Chapter 9 SATCOM in Theater Missile Defense

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The Army's Space and Missile Defense Command serves as the Army's Theater Missile Defense "integrator" to make sure TMD efforts will support joint operations and be effective in protecting U.S. warfighters from all types of missile threats.

OVERVIEW

The joint ballistic missile defense focuses on three areas: theater missile defense (TMD), national missile defense (NMD), and advanced ballistic missile defense technologies. The Ballistic Missile Defense Organization (BMDO) and the Joint Theater Air Missile Defense Organization (JTAMDO) have oversight of these missions. BMDO is the integration systems architect for theater air and missile defenses. JTAMDO coordinates with combatant commanders and the services to develop joint mission requirements, a joint architecture, and a joint capabilities roadmap.

The Army is at the forefront, working with the other Services to develop systems and solutions to missile defense challenges for the United States. The Army's Space and Missile Defense Command serves as the Army's Theater Missile Defense "integrator" to make sure TMD efforts will support joint operations and be effective in protecting U.S. warfighters from all types of missile threats, including ballistic missiles, short-range rockets, unmanned aerial vehicles, and cruise missiles.

Satellites are a critical part of the defensive systems and technologies in place now and planned for the future. Today's threats are very real. The collapse of the Soviet Union may have removed the biggest threat to the United States and its allies, but new areas of concern have surfaced. Attacks on European allies from North Africa and the Middle East, and attacks on Japan from Taiwan and China are always possibilities. The key to preventing enemy attacks is to create a formidable defense. This is where satellites come into play. They are the "eyes in the sky" – waiting to detect and relay information on missile launches that could threaten U.S. interests at home and abroad. Satellites also are instrumental in providing space products to the warfighter throughout all stages of deployment from weather information to communications to positioning/ navigation information.

This chapter will highlight the role that satellites play in the air and missile defenses of the United States. It is no secret that the U.S. is likely to become increasingly engaged in maintaining and restoring regional peace throughout the world, often in an international coalition. To undertake these missions with the greatest degree of success, U.S. warfighters must be able to rapidly deploy to regional crises, work and communicate with allied forces, conduct fast moving ground combat with situational awareness, and protect themselves against air and missile attacks. They cannot do this without the direct or indirect use of satellites.

MISSILE DEFENSE: HOW SATCOM IS USED TO PROTECT ARMY FORCES

The joint ballistic missile defense focuses on three areas: TMD, NMD, and advanced ballistic missile defense technologies. The BMDO and the JTAMDO have oversight of these missions.

Theater Missile Defense

The mission of TMD is to protect forward-deployed U.S. forces, allies, critical military and geo-political assets, and areas of vital interest or importance. Theater missiles include ballistic missiles, air-to-surface missiles (ASM), and cruise missiles (CM) whose targets are within a given theater of operations. Congress has mandated the TMD program.

The theater missile (TM) threat varies with respect to missile range and capability. Since no single system currently employed by the Army can perform the entire TMD mission, a joint "family of systems" (FoS) approach will be used to successfully defeat the threat.

Active defense constitutes measures taken to identify, intercept, and destroy theater missiles in flight that are launched against friendly forces.

Elements of TMD

Theater Missile Defense efforts are integrated across four distinct operational elements. Satellite communications (SATCOM) is incorporated into all of these elements and provides the capability for interoperability, responsiveness, and flexibility in communications for the warfighter.

Active defense constitutes measures taken to identify, intercept, and destroy theater missiles in flight that are launched against friendly forces. The joint FoS will include both lower-tier systems – *those point-defense or asset-defense systems that intercept incoming missiles at relatively low altitudes within the atmosphere* – and upper-tier systems – *those area defense systems that intercept missile targets at longer ranges and outside the atmosphere*.

Passive defense includes measures taken to minimize lethal and destructive effects of theater missiles launched against friendly forces.

Passive defense includes measures taken to minimize lethal and destructive effects of theater missiles launched against friendly forces. Continuously monitored alert systems provide early warning to affected forces so that protective measures can be taken in time to reduce casualties. Passive defense measures also include camouflage, concealment, deception, hardening, and other actions. Attack operations are offensive actions intended to disrupt, destroy, or neutralize enemy TM launch platforms and their supporting command, control, and communications; logistics, and reconnaissance, surveillance, and target acquisition capabilities. Battle Management/Command, Control, Communications, Computers, and Intelligence (BM/C4I) encompasses all of the command and control centers, automated systems, sensors, operations and intelligence activities required to integrate the external and supporting TMD weapons systems into one effective joint TMD capability under the command of the Joint Forces Commander and his designated Area Air Defense Commander.

The Army Role in TMD

The TMD mission is inherently joint. When intelligence indicates that theater missiles may be employed in a theater of operations, the Army may deploy air and missile defense forces to protect the force and selected geopolitical assets from aerial attack and surveillance. Such protection is normally provided within a joint theater. This requires that Army air and missile defense systems are integrated with other services' air and missile defense systems and that operations be closely coordinated.

The Army Air and Missile Defense Command (AAMDC) is the Army's operational lead for Army theater air and missile defense. In wartime, the AAMDC deploys into the theater of operations in support of the Army forces commander. Alternatively, if designated, the joint forces land component commander ensures that Army air and missile defense (AMD) operations are properly coordinated and integrated with those of joint and multinational forces. In peacetime, the AAMDC ensures Army echelons above corps AMD forces are properly trained and ready to support AMD operations. The AAMDC plans and executes a variety of training activities, exercises, and simulations to ensure force readiness. It also coordinates with joint and multinational partners to develop procedures for combined theater AMD operations, interoperability and training.

AAMDC's tactical operations center (TOC) was originally designed and fielded by US Army Space Command as the Army Theater Missile Defense Element. The AAMDC, because of its contingency orientation and its operation with space technologies, relies heavily on an integrated, multi-spectral array of space-based resources for intelligence, tracking, early warning, and communications.

TMD C4I Requirements for Force XXI

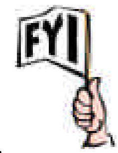
TMD C4I requirements and capabilities to support the mission envisioned by Force XXI are specified in TRADOC Pam 525-91, TMD Integrating Concept. Robust C4I capabilities are required to integrate TMD operational elements and provide commanders the facilities, communications, automated decision aides and information they need to effectively plan and execute TMD operations. SATCOM, as one of many C4I tools, can be used to fulfill some of these critical TMD requirements that allow commanders to perform the following tasks:

- Effectively plan and execute TMD operations – active and passive defenses and attack operations.
- Tactically deploy and perform TMD operations on the move.
- Quickly reconfigure workstations and communications linkages based on situation.
- Maintain full situational awareness through TOC displays.
- Share a common relevant picture of the battlespace for all sea, land, and air targets.
- Control distant units and weapons systems conducting missile defense operations.
- Deploy and control tactical space platforms equipped with sensors or communications packages capable of supporting TMD operations.

Communications necessary to support TMD operations include a global information network that is accessible to all units and activities involved in TMD operations. This network must enable the warfighter in a tactical headquarters to quickly access national, joint, and multinational BM/C4I systems permitting a rapid exchange of critical information for informed decision-making. Communications systems for TMD operations must be designed to allow for employment of decentralized operations and direct sensor-to-shooter dissemination of targeting information. Information-age processors and high data rate communications systems must be integrated with sensors, weapons, and BM/C4I systems, allowing critical information to be exchanged in real time. Other specific requirements include the following:

- Broadcast communications for dissemination of intelligence, early theater missile warnings, Nuclear, Biological and Chemical hazard warnings, and mission changes or updates.
- Reliable, high-capacity, long distance (over-the-horizon) communications to include satellites and surrogate satellites.
- Allocation of sufficient SATCOM assets to support Special Operations Forces (SOF), force warning, and other TMD operations.
- Use of high capacity, reliable, distributed, jam-resistant data communications to support TMD operations.
- Interoperability with national, joint, and multinational systems for effective data and voice communications.

Many of these requirements are a direct result of lessons learned during the Gulf War, where the centralized



In January 2000, the Army opened the National Missile Defense User Lab at USARSPACE in Colorado Springs. The purpose of the lab is to allow users from all services a vehicle to identify and test ideas and concepts for NMD. The user lab is patterned after the Army's Battle Lab concept.

The information collected by space-based early-warning and intelligence satellites, processed on the ground, and relayed by SATCOM to or between the various TMD elements, is used to pinpoint launch locations, track the path of launched missiles, and predict the point of impact.

processing and distribution of TMD information proved to be a weak link in the effort to defend friendly forces and facilities. For example, it took less than ten minutes for an Iraqi Scud to reach Saudi Arabia after launch. Meanwhile, launch detection information had to travel from a Defense Support Program (DSP) satellite to a ground station, to be relayed via communications satellites to Cheyenne Mountain in Colorado Springs for processing, and then be bounced again by satellite to Central Command and the Patriot units standing by in theater. There was no direct sensor-to-shooter communications. With technology proliferating to the point where precision munitions are accessible to hostile nations, it is an absolute necessity that precise information on launch point and time, type missile, trajectory, and predicted impact point and time be quickly developed, processed, and disseminated to the soldiers in the field. Reports from two North Korean defectors in late 1997 indicated that North Korea is working hard in quickly developing missiles capable of striking U.S. forces in Asia and eventually Alaska. While these missiles are reportedly not very accurate, they are said to be extremely destructive. Additionally, these defectors report that North Korea is selling missiles to Iran, Iraq, and Libya at a cost of up to $1 billion annually.

Use of SATCOM in TMD Operations

Satellites have a critical role to play in TMD operations. Detection and response to a launch within only a few minutes is imperative. The information collected by space-based early-warning and intelligence satellites, processed on the ground, and relayed by SATCOM to or between the various TMD elements, is used to pinpoint launch locations, track the path of launched missiles, and predict the point of impact. External sensor systems supporting the core TMD architecture include DSP satellites and their ultimate replacement, the Space-Based Infrared System (SBIRS), National Systems, and Airborne Warning and Control System Extended Airborne Global Launch Evaluator. Launch, operation, and logistical support of these space systems and their ground control elements are primarily the responsibility of the U.S. Air Force, with other services providing assistance as needed. The transmission, ground-based processing, and dissemination of the data collected, however, are of vital importance to Army TMD operations.

The design and conduct of any phase of TMD operations may require the use of split-based operations in which significant support is provided to the operational commander by forces remaining in the Continental United States (CONUS). While units are being mobilized for an operation and during the rest of the pre-deployment phase, Department of Defense (DoD) SATCOM systems, particularly UHF single-channel, can provide the critical linkage between the contingency area and CONUS units. These SATCOM links permit units still in CONUS to obtain current information on the tactical situation. With space as an integral part of national military strategy, SATCOM will be used in joint TMD planning by Army warfighters because of its near-continuous presence, its reliability, and the security provided by DoD SATCOM systems.

TMD operations are shaped by intelligence. Assessments made by strategic and operational planners on potential actions to be taken in response to threats are based upon intelligence gathered largely by space-based resources. Because intelligence is so vital to planning an operation and making informed decisions, collection of this intelligence will often be accomplished by national satellite systems providing worldwide surveillance and reconnaissance. Although these satellite systems are controlled at the national level, Army forces can receive relevant information through the Tactical Exploitation of National Capabilities (TENCAP) program. TENCAP provides Army commanders a means to obtain, correlate, and disseminate national intelligence information that might impact their areas of operations. Types of information gathered in preparing for TMD operations include location of missile manufacturing, assembly, and storage depots; enemy theater missile systems' performance characteristics; the identity, location, composition, and strength of units capable of launching theater missiles; and launch site locations.

TMD operations are focused on deterring threat forces while simultaneously supporting maneuver units on the battlefield. TMD BM/C4I activities are focused to collect and disseminate important, time-sensitive information for force protection; develop targeting plans, and conduct the coordination needed to ensure successful execution of those targeting plans. Space-based detection and tracking information is fed into the Joint Tactical Information Distribution System (JTIDS), which then disseminates information to all services and their missile defense operations. These systems are interoperable because connectivity must be maintained and data must be shared quickly by the various weapons systems and Command and Control centers. Again, SATCOM resources are used extensively to disseminate the information needed for TMD operations.

THE PROCESS OF DETECTION AND DESTRUCTION

The "family of systems" that the U.S. relies on to protect its forces and critical assets from ballistic and cruise missile provides what can best be described as a carefully integrated "layered" defense (figure 9-1).

Army attack operations forces (attack helicopters, Army Tactical Missile System units, SOF, etc.) depend on intelligence information that is gathered by satellites and other sources, and relayed between nodes via SATCOM, to find and identify enemy TM launchers and supporting infrastructure. Timely attacks on launchers, missiles on the ground, transload points, supply and maintenance bases, fuel and oxidizer vehicles, transportation chokepoints, and other targets, can significantly disrupt the enemy's TM launch capability. Such actions limit damage caused by TMs and reduce the pressure on active defenses.

Once a ballistic missile is launched, infrared sensors on DSP or SBIRS early-warning satellites detect the heat exhaust from the missile as it rises above the clouds. The Joint Tactical Ground Station (JTAGS), deployed in theater, receives data from the satellite, processes it to determine whether an actual launch has occurred, then prepares messages that it inserts into theater tactical nets, e.g. JTIDS. The messages include estimated launch point and time, azimuth, trajectory, predicted impact point and time, and likely missile type. The messages are updated at short intervals during the missile's flight until burnout (when the missile is no longer visible to the down looking infrared sensors); the final

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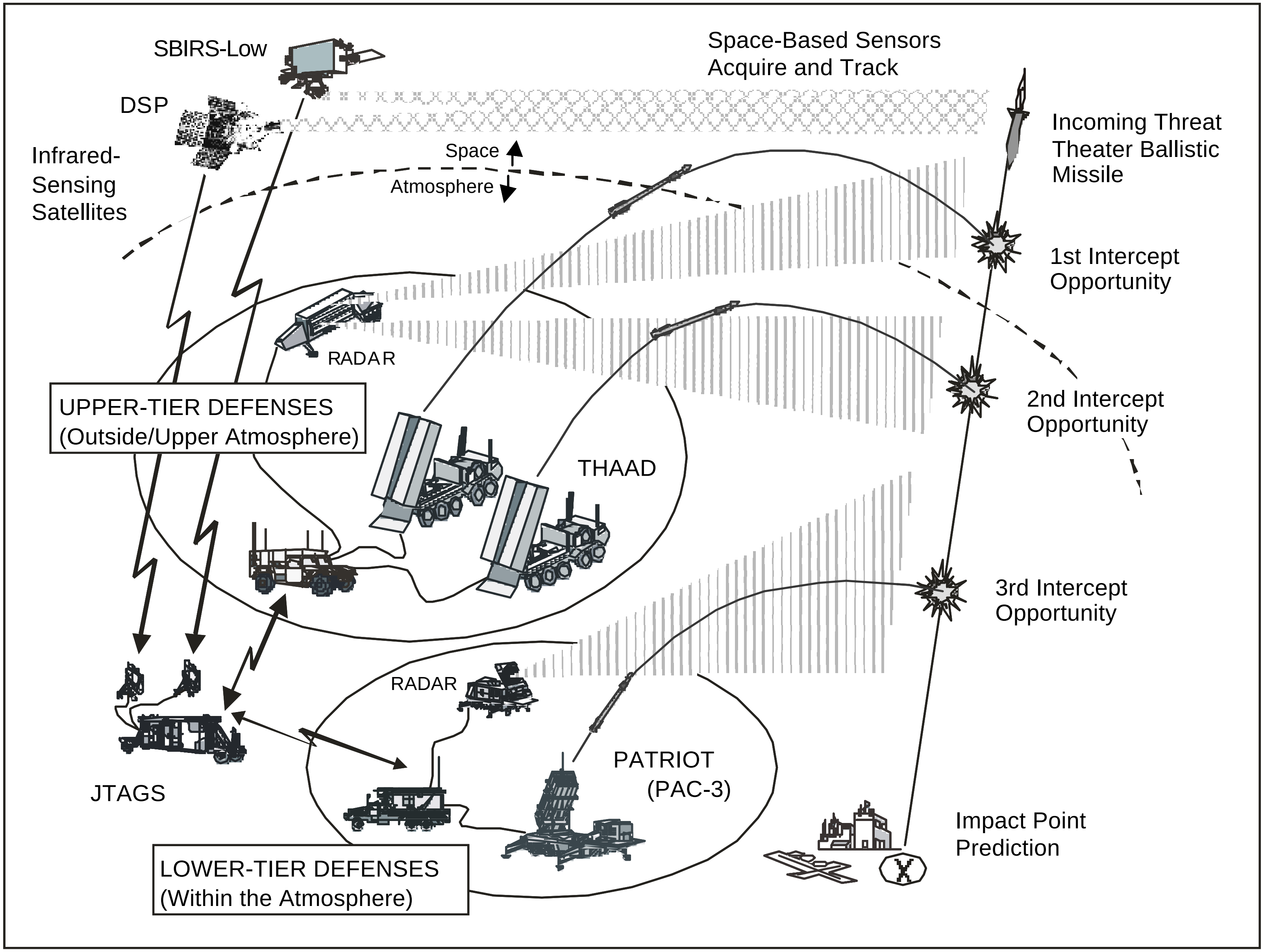


Figure 9-1. Defense of the US Borders by Use of Satellites is Best Described as a Layered Approach

After initial problems in target interception, the THAAD system appears to be headed for success. It has chalked up two successful intercepts.

message also includes information on the missile course, attitude, and trajectory at burnout. (Note: Midcourse sensors have traditionally been land-based radar arrays, but the SBIRS-Low system will soon complement the land-based sensors.)

Destruction of a warhead can occur at several points after launch. The first opportunity is during the boost phase just after its launch and as the missile is reaching the high point of the trajectory. During the boost phase, the exhaust plumes are easier to detect and track. The advantage of attacking a missile during its boost phase is that destruction includes any submunitions or chemical/biological agents onboard before they can be released. The United States Air Force's Airborne Laser (ABL), and properly positioned sea-based TMD systems, will be capable of boost phase intercepts.

A Theater Ballistic Missile (TBM) spends the majority of its flight time in its midcourse trajectory. Time is an advantage during this phase, and multiple defensive launches can be made, if necessary, to achieve destruction. A disadvantage of midcourse defense measures is that they may be susceptible to decoys or other countermeasures. Army's Theater High Altitude Area Defense (THAAD) and the Navy Theater Wide Defense Systems will conduct midcourse, high endo-atmospheric and exo-atmospheric intercepts of theater ballistic missiles with countermeasures.

Terminal defenses, as the final opportunity, operate as the missile reenters the atmosphere and homes in on its target. The advantage to terminal defenses is that the atmosphere tends to separate the warhead from chaff or other decoys allowing more accurate targeting. The disadvantages include a limited area of defense, short response time, and the possibility of being hit with submunitions from the warhead.

In all cases, airborne and ground-based sensors provide the information that tells an interceptor where to fly in order to intercept and kill the incoming target. They also continue to update the interceptor as it continues on its trajectory. In the "endgame," the interceptor either maneuvers close enough to the target to destroy it with a blast-fragmentation type warhead (Patriot PAC-2, for example), or a "kill vehicle" slams into and destroys the target (PAC-3 or THAAD). Satellites are crucial at each point of the process.

ACTIVE DEFENSE PROGRAMS

Theater High Altitude Area Defense System

THAAD, which is preparing to enter the Engineering and Manufacturing Development acquisition phase, is a land-based, mobile, guided missile system designed to attack theater missiles in the upper reaches of the atmosphere or even outside the atmosphere. It will provide extended area coverage by intercepting and destroying incoming theater missiles at ranges and altitudes significantly far away from their intended targets. There are four parts to the THAAD system – the Battle Management/ C4I system, the Ground-Based Radar (GBR), the launcher, and the interceptor. The longer range of THAAD allows multiple opportunities for the system to destroy a theater missile that might have a range of hundreds of kilometers or more.

The THAAD BM/C4I system analyzes satellite and radar-tracking data, selects targets and assigns interceptors, calculates fire control solutions, and issues firing commands to the launchers. When the Battle Manager receives information of launch detection or a warning message, it cues the THAAD radar to search the appropriate airspace for the target.

The GBR then searches, acquires, classifies, discriminates, and tracks theater missile targets and transmits guidance and target updates back to the BM/C4I, which assigns a launcher and the THAAD interceptor is launched. This missile is capable of operating both within and above the atmosphere. THAAD missiles physically collide with the target missile ("hit-to-kill") rather than destroy it by exploding nearby. An on-board infrared seeker provides final guidance to the target.

Throughout all phases of the THAAD target acquisition and destruction, communications must be relayed quickly and accurately. This is possible using SATCOM from a variety of sources, some of which are classified.

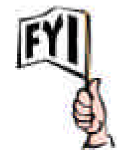
Patriot

The Patriot weapon system is a mobile guided missile system designed to intercept and destroy theater ballistic missiles, unmanned aerial vehicles (UAV), manned aircraft, ASMs, and CMs. It is part of the lower-tier segment of theater missile defense. A Patriot missile is designed to acquire and destroy a target within the atmosphere. It will provide another engagement opportunity for targets missed or not engagable by upper-tier defenses.

The radar is critical to all phases of a Patriot engagement. The radar scans the skies for possible targets. Once targets are found, the Patriot system tracks and illuminates them so that interceptors can home in on the reflected radio waves.

Today, the Army uses the Patriot PAC-2 interceptor that was first used in the 1991 Gulf War to defend against Iraq's al-Hussein (Scud-B) missiles. The use of the Patriot air defense system in Desert Storm has been the only battlefield experience to date of ballistic missile defenses. Although moderately successful, the inherent technical limitations of the Patriot system during the Gulf War demonstrated how difficult theater missile defense really is. The al-Hussein missiles were incredibly unstable due to poorly done Iraqi modifications made to increase their range and payloads. Mid-air breakups and wild, spiraling trajectories presented extremely challenging targets for the Patriots. Now under development is the Patriot Advanced Capability – 3 (PAC-3). This is a system-wide upgrade that applies extensive hardware and software modifications to the current Patriot system. PAC-3 includes a new extended range hit-to-kill interceptor that will increase the firepower, effectiveness, and lethality of the Patriot system.

What does all this have to do with SATCOM? It is important to know what missile defense systems are used today and what limitations they experience under battlefield conditions. TMD systems, as with nearly all weapons systems on the modern battlefield, are highly dependent on satellite communications, as well as Global Positioning System, space-based weather and intelligence data, radars, ground-based radio (voice and data), and other communication systems. SATCOM is a critical element for missile defense to succeed in protecting Army forces.



The PAC-3 is the "next generation" Patriot missile that uses kinetic energy to destroy its targets rather then employing a highly explosive warhead. PAC-3 testing missions have proven the missile is a keeper! At White Sands Missile Range, the PAC-3 successfully intercepted its target five out of five times. Remaining test missions will consist of 14 PAC-3 missiles intercepting various classes of targets.

Defense Support Program (DSP) has, over the years, detected thousands of launches including the Scud missiles launched by Iraq in the Gulf War.

There will be an overlap period when DSP satellites will be compatible with and be used in conjunction with Space-Based Infrared System (SBIRS) satellites until the SBIRS constellation is complete and operational.

Satellite Early Warning System

The Satellite Early Warning System (SEWS) includes orbiting DSP satellites and terrestrial data processors. The DSP early warning satellites use infrared detectors to sense heat from missiles launched from earth and from nuclear detonations. DSP satellites have been in orbit since 1970. The system detects and reports, in near real time, information on the range and heading of a missile for early warning and interception. Confirming launch detection and mapping the missile trajectory takes about two minutes.

The DSP satellites relay the warning data, via dedicated communications links, to NORAD and USSPACECOM Early Warning Centers within Cheyenne Mountain in Colorado. These Centers analyze the information and determine the possibility of a threat. They then immediately forward the data to various agencies and areas of operation worldwide. Because of the use of satellites, this entire procedure occurs within just minutes. In addition, DSP satellites (and SBIRS satellites in the future) send the data directly to in-theater processors for TMD. Both the in-theater processors and the CONUS-based Early Warning Centers provide warning messages to theater during periods of conflict, providing a robust, redundant warning capability. The concept will continue, and even be expanded, with the follow-on SBIRS program.

DSP has, over the years, detected thousands of launches including the Scud missiles launched by Iraq in the Gulf War. Based partly on the Gulf War lessons learned, the DoD redefined the requirements for missile defense early warning, resulting in the SBIRS.

Space-Based Infrared System

SBIRS has four missions: missile warning, missile defense, technical intelligence, and battlespace characterization. SBIRS will have two major components: SBIRS-Low, which consists of low earth orbiting satellites (less than 530 miles above the earth), and SBIRS-High, with satellites in geosynchronous (22,300 miles above the earth) and highly elliptical orbits. To ensure there is no lapse in protection or warning coverage, as DSP ages and is phased out, the SBIRS is being constructed. There will be an overlap period when DSP satellites will be compatible with and be used in conjunction with SBIRS satellites until the SBIRS constellation is complete and operational.

SBIRS's two components will work together to detect, track, and help destroy an incoming target. SBIRS-High satellites can be compared to a "tripwire," sweeping the surface of the earth looking for signs of a launch. Once detection is made and the target is launched, SBIRS-High satellites look "down" upon the earth, continue to track the threat warhead, and relay targeting/tracking information to SBIRS-Low satellites. SBIRS-Low will be able to track the warhead more accurately by looking above the horizon: heat from a missile framed against the cold space environment is easier to see and differentiate from decoys from the lower altitudes of the SBIRS-Low satellites. Response and launch are then coordinated and accomplished.

Joint Tactical Ground Station

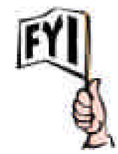
JTAGS is a transportable tactical ground station that performs data processing of infrared sensor data downlinked directly into theater from the DSP constellation of satellites. Army and Navy personnel jointly man it. Currently, there are two units serving in a contingency role outside CONUS. JTAGS processes the downlinked data and disseminates early warning, alerting, and cueing information on TBMs and other infrared events of interest throughout the theater. Tactical communications are provided via a Ultra High Frequency SATCOM voice and data capability, and the TIBS and JTIDS protocols are supported using organic radios. An Mobile Subscriber Equipment-TRI-TAC capability allows the unit to be connected to local or installation phone switching networks. The data is also sent via Secure Telephone Unite (STU)-III to an injection node in support of the TENCAP Tactical Receive Equipment and Related Applications network. The JTAGS provides information on missile launch time, location, state vector at burnout, and predicted impact time and location in near real time. JTAGS's communications link to the theater's various alert and warning networks to provide rapid and redundant capability and to ensure the theater commander is not vulnerable to a single-point failure of the TENCAP Tactical Exploitation System. (An upgraded version of JTAGS, called the Mobile Multi-Mission Processor will receive and process SBIRS data.)

NATIONAL MISSILE DEFENSE

The NMD system will provide for the defense of the United States against an accidental or deliberate attack by a limited number of intercontinental ballistic missiles. The current program strategy is to pursue a three-year initial development and planning phase, followed by a five-year system acquisition and deployment phase should the maturing threat so warrant. The Army, with BMDO funding and guidance, is currently the lead service for development of the dedicated NMD ground-based elements (Ground Based Interceptor, GBR, and portions of the Battle Management for Command, Control, and Communications (BMC3)). When deployment is directed, the Army will field, operate, and sustain the NMD ground-based elements.

NMD is a unique, one-of-a-kind system that will operate 24 hours a day, 365 days per year, requiring continuous on site manning. To maximize the use of resources, the command and operational structure has been developed to support a single NMD Site Complex which interfaces with an Army Component Command Center (collocated with US Army Space Command headquarters in Colorado Springs, CO), upgraded early warning radars, and DSP/SBIRS as part of the overall NMD Command Operations.

An NMD engagement will be initiated based on early warning sensors that detect and designate hostile ballistic missile launches towards the U.S. BMC3 aids the operators in identifying the reentry vehicles and planning the engagement, using data from surveillance and tracking systems, including the ground-based radar. After launch and burnout of the interceptor, a kill vehicle separates and repositions itself, pointing the seeker field-of-view to the predicted target position. The onboard computer receives additional target updates from the BMC3, based on surveillance data, and executes intercept course correction maneuvers. Once uncapped, the onboard passive seeker searches and acquires the target and any associated objects in its field-of-view. The target is designated, using onboard target selection capabilities. The kill vehicle then tracks the target and maneuvers to achieve a direct impact kill. Radar and EW sensors



The ability of the U.S. military to meet a year 2005 deadline for fielding and manning a National MIssile Defense (NMD) System (should the President decide to do so) was greatly enhanced when the TRADOC System Manager for NMD was established.

Satellites are the "eyes" for the defensive protection required against missile attacks directed toward U.S. forces and CONUS.

monitor the intercept for kill assessment or further battle management action.

The 1995 BMD Program Review shifted NMD emphasis from technology to a Deployment Readiness Program (DRP). The President is expected to decide in June 2000 whether to proceed with deployment of a system to be operational by 2005. If deployment is not directed, the DRP would continue, and review would occur each subsequent year until system maturity and threat factors warrant deployment.

ADVANCED CONCEPTS

The Airborne Laser

An Air Force initiative intended for in-flight demonstration by 2002 is the Airborne Laser that is carried on a modified Boeing 747 aircraft. The ABL will attack a TBM during the boost phase by focusing its primary laser beam on the missile's metal surface and heating it to the point where the metal structurally fails, or the missile explodes from internal pressure. This would cause the missile to fall short of its intended target, before deployment of any submunitions.

Operationally, each ABL-equipped aircraft would patrol friendly airspace until early-warning satellites or onboard sensors detect a TBM launch and alert the aircraft. A 1.5-meter mirror located inside the nose of the aircraft would focus a beam from a megawatt-class chemical laser onto the missile and keep it locked onto the target until destruction.

Medium Extended Air Defense System

The Army's Medium Extended Air Defense System (MEADS) will be a low-to-medium-altitude air and missile defense system designed to support future force projection operations. MEADS, which will ultimately replace Patriot, is an international system involving Germany, Italy, and the U.S. The system, formerly known as Corps SAM, will detect, acquire, engage, and intercept theater ballistic missiles, cruise missiles, and UAVs, aircraft, and large caliber rockets in defense of corps assets and maneuver forces. Satellites are used to relay information on targets to the system so that defensive action can be taken.

MEADS will provide 360-degree lower-tier defense. While developed primarily to protect the maneuver force against all aerial threats, MEADS will also be employed in the early phases of force projection operations to protect theater assets and forces as the lower-tier system of TMD. As Patriot and THAAD arrive in theater, MEADS will move with and continue to protect the maneuver force during the expansion, decisive operations, and reconstitution phases of contingency operations.

SUMMARY

Satellites are the "eyes" for the defensive protection required against missile attacks directed toward U.S. forces and CONUS. Satellites are expected to pinpoint launch locations, track the path of incoming missiles, and predict the points of impact.

They also relay the information necessary to launch defensive actions within minutes. Intelligence is key to the missile defense mission. National satellite systems provide worldwide reconnaissance and surveillance of potential threat locations and early-warning satellite systems alert ground forces when a launch occurs. At each point in the flight path of the missile, however, communications satellites are involved in tracking or carrying information that will eventually destroy the threat missile before it reaches its intended destination.

AAMDC
Army Air and Missile Defense Command

ABL
Airborne Laser

AMD
Air and Missile Defense

ASM
Air-to-Surface Missile

BM
Battle Management

BMC3
Battle Management Command, Control, and Communications

BMDO
Ballistic Missile Defense Organization

C4I
Command, Control, Communications, Computers, and Intelligence

CM
Cruise Missile

CONUS
Continental United States

DOD
Department of Defense

DRP
Deployment Readiness Program

DSP
Defense Support Program

FOS
Family of Systems

GBR
Ground Based Radar

JTAGS
Joint Tactical Ground Station

JTAMDO
Joint Theater Air Missile Defense Organization

JTIDS
Joint Tactical Information Distribution System

MEADS
Medium Extended Air Defense System

NMD
National Missile Defense

SATCOM
Satellite Communications

SBIRS
Space Based Infrared System

SEWS
Satellite Early Warning System

SOF
Special Operations Forces

STU-III
Secure Telephone Unit

TBM
Theater Ballistic Missile

TENCAP
Tactical Exploitation of National Capabilities

THAAD
Theater High Altitude Area Defense

TM
Theater Missile

TMD
Theater Missile Defense

TOC
Tactical Operations Center

UAV
Unmanned Aerial Vehicle